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GB 1298527 A

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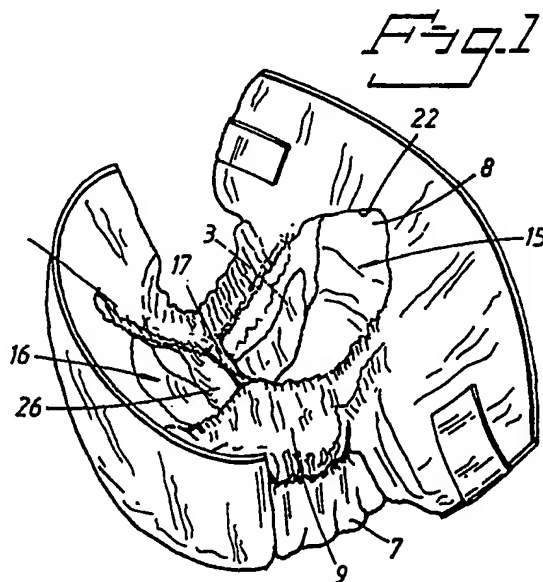
UK CL (Edition N) A3V , A5R RPC RPG RPL

INT CL⁶ A61F 13/15

Online : WPI

(54) Absorbent article

(57) An absorbent article such as a diaper or incontinence guard has two openings 15, 16 in the top-sheet, one for urine and one for faeces. A piece of flexible material lies transversely across the diaper between the openings, located between the absorbent body and the top-sheet and acts as a barrier to prevent the waste products mixing. The top-sheet is only joined to the diaper at its edges and, after manufacture, elastic threads 10, 11, 24, 25 act to bring the diaper from the flat state of Figure 2 to the relaxed state of Figure 1 where the top-sheet is distanced from the absorbent body. This also causes the flexible material to unfold or rise to form the barrier. The barrier may take varied forms.



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Fig. 1

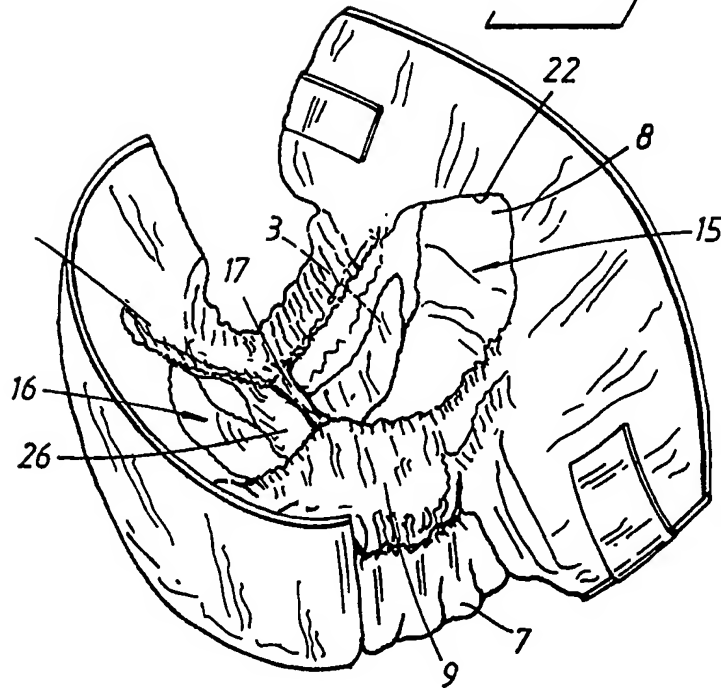


Fig. 2

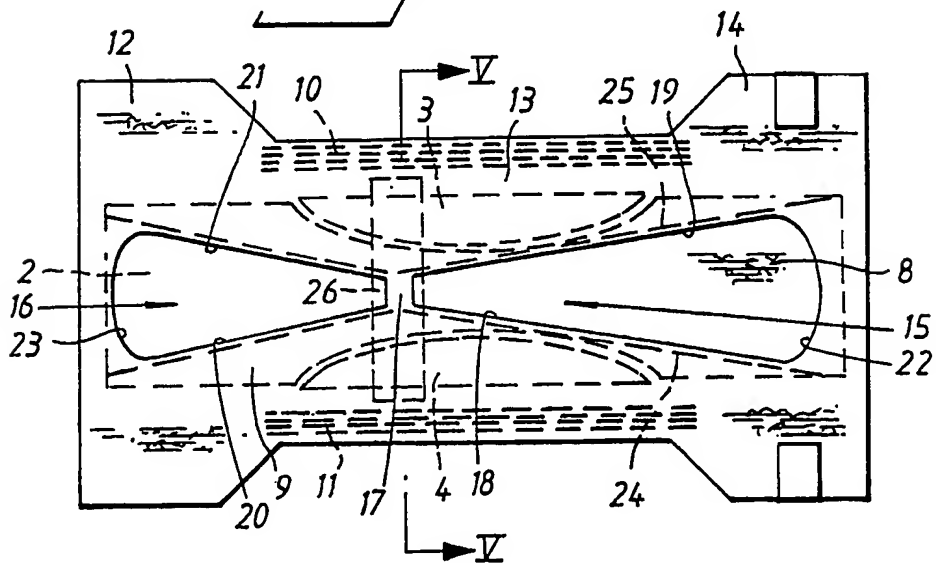


Fig. 3

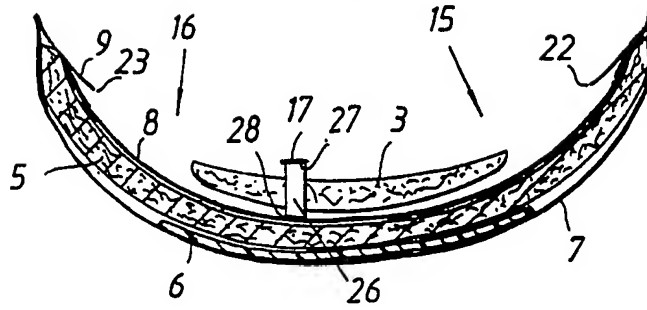


Fig. 4

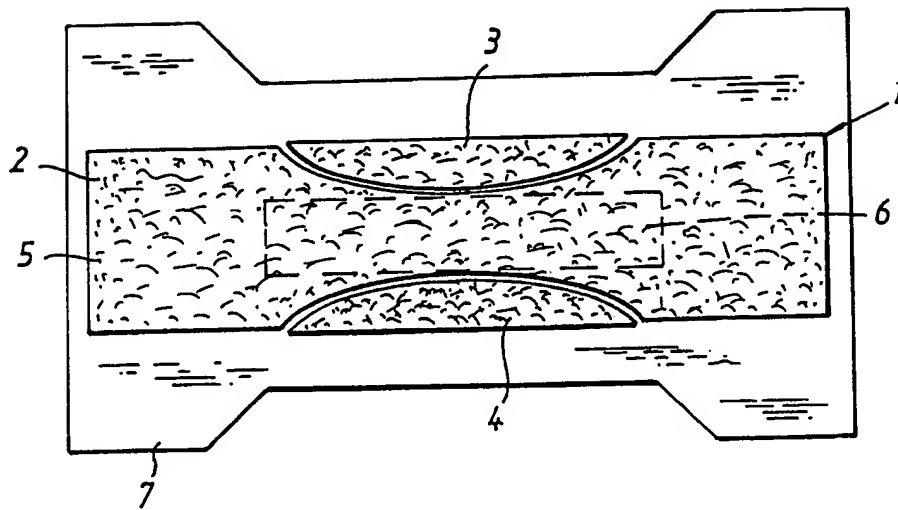


Fig. 5

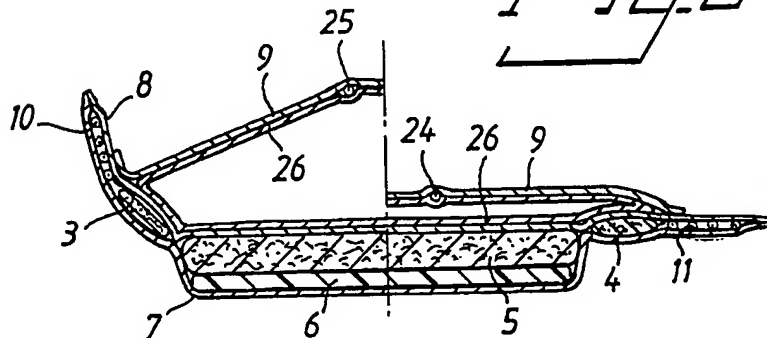


Fig. 6

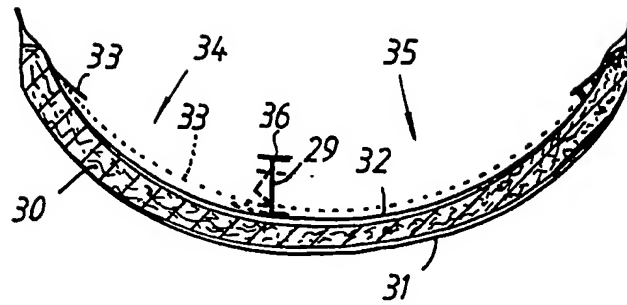


Fig. 7

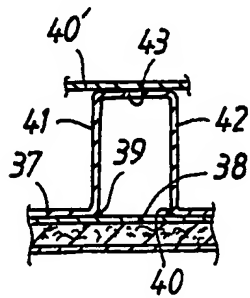


Fig. 8

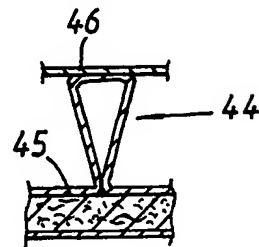


Fig. 9

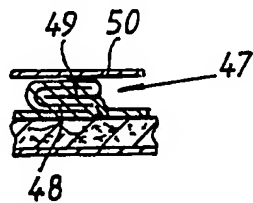
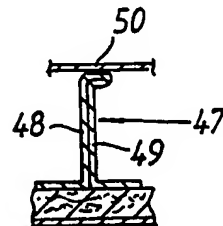


Fig. 10



AN ABSORBENT ARTICLE

5 The present invention relates to an absorbent article which has a front part, a rear part and an intermediate crotch part, such as a diaper, an incontinence guard or like article, which includes an absorbent body, a bottom sheet comprised of liquid-impermeable material and joined to the absorbent body, and a top sheet which over a large part of its surface is free from connection with the absorbent
10 body, i.e. not joined thereto, and which when the article is worn lies proximal to the wearer's body, said top sheet including an elongated opening which extends from the rear article part into the crotch part, and elastic devices which are attached to the top sheet in a stretched state and which when contracting from their stretched state cause
15 that part of the top sheet which is not joined to the absorbent body to be distanced from said body.

Diapers which are provided with an opening in the top sheet are known from AU-A-45217/85, EP-A2-0,357,298 and EP-A2-
20 0,486,006 and are intended to avoid irritation of the wearer's skin as a result of excrement coming into contact with the skin. According to these publications, this is achieved because the absorbent body is brought to a basin-like shape as the elastic devices provided in the top sheet contract, at the same time as the top sheet is therewith
25 distanced from the bottom of the basin to form a basin lid or cover which includes an opening. One problem with diapers of this kind is that the opening provided in the top sheet must be sufficiently large and so positioned as to ensure that excrement will fall safely from the wearer down onto the absorbent body. Any excrement that lands on the top sheet is highly liable to result in leakage and
30 irritation of the skin. It has also been found that the skin is much more sensitive to a mixture of urine and faeces, and consequently it is important to minimize the risk of such a mixture coming into contact with the
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wearer's skin while the article is worn. When urine and faeces mix, ammonia is formed which leads to an increase in pH and also in greater activity of the faecal enzymes.

5 An object of the present invention is to ensure that urine and faeces will fall safely onto the absorbent body, and to prevent the urine and faeces discharged onto the absorbent body from mixing together. This object is achieved in accordance with the invention with an absorbent article of
10 the kind defined in the introduction which is characterized in that the top sheet also includes a second elongated opening which extends from the front article part and into the crotch part, and in that a piece of flexible material extends transversely across the article between the
15 absorbent body and the top sheet and within that area of the top sheet which lies between the two elongated openings, said piece of material being attached to the absorbent body and the top sheet. The provision of a front opening in the top sheet ensures that urine discharged from
20 the wearer will fall onto the absorbent body, and the flexible piece of material forms a barrier which prevents urine from falling or running down over that part of the absorbent body onto which faeces are discharged and also to prevent faeces from entering that part of the absorbent
25 body onto which urine is discharged. In addition to preventing urine and faeces mixing together, the arrangement also prevents faeces from coming into contact with the wearer's genitals.

30 According to one preferred embodiment of the invention, the absorbent body includes a liquid-permeable casing sheet on that side thereof which lies distal from the bottom sheet, and that area of the top sheet which lies between the two elongated openings is located between the wetting point and
35 the faecal discharge point. The side edges of the two elongated openings diverge from the transverse edges in the crotch part, and the elastic devices in the top sheet

extend along the side edges of the openings, and the material piece mounted transversely between the top sheet and the inner casing sheet of the absorbent body is comprised of a tubular body or member which is connected to the inner casing sheet and the top sheet transversely over a narrow region. The tubular body is advantageously formed integral with the top sheet.

The invention will now be described in more detail with reference to the accompanying drawings, in which

Fig. 1 is a schematic perspective view of one embodiment of an inventive diaper, taken obliquely from above;

Fig. 2 is a schematic illustration of the diaper shown in Figure 1 taken from above with the diaper in a flat state;

Fig. 3 is a schematic longitudinal sectional view of the diaper shown in Figure 1;

Fig. 4 is a view corresponding to the view of Figure 2 and illustrates the bottom sheet and the absorbent body of the diaper shown in Figure 1;

Fig. 5 is a cross-sectional view taken on the line V-V in Figure 2;

Fig. 6 is a longitudinal sectional view corresponding to the sectional view of Figure 3 and illustrates a second embodiment of an inventive diaper; and

Figs. 7-10 illustrate various variants of the material pieces suitable for use in an inventive diaper.

The diaper illustrated in Figures 1-5 includes an absorbent body 1 which in the case of the illustrated embodiment is comprised of an hourglass-shaped main body 2 and two side

bodies 3, 4. The main body 2 is comprised of two sheets 5, 6. The upper sheet 5 and the side bodies 3, 4 are comprised of air-laid cellulose fluff. The bottom sheet 6 is preferably comprised of air-laid cellulose fibres and is preferably compressed more heavily than the upper sheet 5. Alternatively, the bottom sheet 6 may be comprised of absorbent reel material of the type described in Swedish Patent Application No. 9203445-3, which includes a dry-formed sheet containing 5-100% cellulose fibres and has a density of between $0.2-1.0 \text{ g/cm}^3$ and a surface weight of between $30-2,000 \text{ g/m}^2$ and which has been formed by compressing a cellulose-fibre containing web without subsequent defibration and fluff building. The reader is referred to the aforesaid patent application for a closer study of this type of reel material. As will be seen from Figure 4, the sheet 6 is rectangular in shape and extends beneath only a part of the sheet 5.

The absorbent body 1 is enclosed between an outer casing sheet or bottom sheet 7 of liquid-impermeable material, for instance polyethylene plastic, and an inner liquid-permeable casing sheet 8, which is preferably made of nonwoven material. The sheet 8 is preferably similar to the bottom sheet 7 and the sheets are joined together at parts which lie outside the absorbent body 1. As will best be seen from Figure 4, the side bodies 3, 4 are located laterally slightly beyond the main body 2, and the casing sheets 7, 8 are joined together in the gap presented between the main body and the side bodies.

The diaper also includes a top sheet 9 which is similar to the casing sheets 7, 8 and is fastened thereto along diaper edge parts, so that the top sheet will be essentially free from connection with the absorbent body 1, i.e. not joined thereto. The top sheet is made from a skin-friendly material and may either be liquid-impermeable or liquid-permeable. As shown in Figures 1 and 2, the diaper is

provided with leg elastication in the form of elastic devices 10, 11 which extend along the side edges in the crotch part 13 and in parts of the front diaper part 12 and the back diaper part 14. In the illustrated case, the elastic devices are comprised of four elastic threads which have been attached in a stretched state between the bottom sheet 7 and the inner casing sheet 8 and fastened to said sheets. It will be understood, however, that the elastic threads may be more or fewer in number and that other types of elastic devices may be used, such as elastic ribbon, film strips having elastic properties, etc. It will also be understood that the elastic devices 10, 11 may instead be placed between the top sheet 9 and the inner casing sheet 8.

The top sheet 9 includes two symmetrical openings, a rear opening 15 and a front opening 16, which are elongated in the longitudinal direction of the diaper. That region 17 of the top sheet 9 which lies between the openings 15, 16 in the longitudinal direction of the diaper is located between the wetting point and the faecal discharge point. By wetting point is meant that area of the diaper within which urine can be expected to be discharged when the diaper is correctly positioned on the wearer, while by faecal discharge point is meant correspondingly that region within which faeces are expected to be deposited when the diaper is positioned correctly, i.e. those regions which lie opposite the urethral orifice and the anus of the wearer respectively, while taking into account normal variations in the anatomy of the wearer within the wearer's size range for which the diaper is dimensioned. The side edges 18, 19 and 20, 21 of respective openings 15 and 16 diverge respectively forwardly and rearwardly from the top sheet region 17, and the openings have arcuate transverse edges 22, 23 which extend slightly from the rear and front end of the absorbent body.

Two elastic threads 24, 25 are attached in a stretched state to the top sheet 9 and extend from the front part of the front diaper part 12 to the rear part of the rear diaper part 14. The threads 24, 25 extend convergently towards one another from the front diaper part 12 to the region 17 of the top sheet 9, along the side edges 20, 21 of the opening 16, and then extend along the side edges 18, 19 of the opening 15 roughly to the level of the rear edge 22 of the opening 15. In the illustrated embodiment, the threads 24, 25 are attached between the top sheet and narrow nonwoven strips (not shown) which are secured to the threads and to the top sheet by gluing or in some other suitable way. In the illustrated embodiment, the strips are positioned along the full length of the threads and the threads are therewith secured to the top sheet along their full lengths. This is not absolutely necessary, however, since the desired function can be achieved by fastening the threads to the top sheet at their respective ends and at the region 17.

According to one variant, the nonwoven strips are secured to the top sheet along their edges, so as to form elastic-thread guide passages. In this case, it is sufficient to fasten the threads to the top sheet at the ends of the passages. Thus, when the nonwoven strips extend along the full length of the threads, it is sufficient to fasten the ends of the threads to the top sheet. The threads will preferably extend freely in these guide passages. The guide passages can be formed by folding the top sheet in conjunction with cutting-out the openings 15, 16, therewith forming the aforesaid nonwoven strips integrally with the top sheet.

The threads can also be fastened directly to the top sheet by the technique known from Swedish Patent Application No. 9304232-3 filed on the 21 December 1993. This Application describes how elastic elements can be joined directly to an

underlying substrate with the aid of thermoplastic components which are locked to the elastic elements by mechanical locking or chemical adhesion and which are joined to an underlying substrate, preferably by ultrasonic welding. The reader is referred to this last-mentioned Swedish patent application for a closer study in this regard.

A tubular body 26 is attached in a flattened state within the region 17 of the top sheet between the top sheet and the absorbent body, and extends transversely between the points at which the top sheet is fastened to the casing sheets 7 and 8. The upper and lower side of the tubular body 26 is attached respectively to the top sheet 9 and to the inner casing sheet 8 by means of a join which has a small extension in the longitudinal direction of the diaper, for instance by means of a glue bead.

Figure 2 shows the diaper in a flat state, by which is meant the state in which the diaper is found during manufacture, the diaper in this state being held stretched against the spring force of the elastic devices mounted thereon. When the finished diaper is released, the elastic devices 10, 11, 24 and 25 endeavour to contract to a fully relaxed state and therewith bring the diaper to the shape shown in Figures 1 and 3.

The top sheet 9 is folded and shortened by contraction of the elastic threads 24, 25. Shortening of the top sheet is enabled by curving of the main body 2 of the absorbent body 1 at the same time as the side bodies 3, 4 swing upward about their respective hinges formed by the casing sheets 7, 8 joined in the gap between the side bodies 3, 4 and the main body 2 respectively. The top sheet 9 will thus be held distanced from the absorbent body 1 by virtue of the action of the elastic threads 24, 25.

Because the top side and the bottom side of the tubular body 26 are fastened respectively to the top sheet 9 and to the inner casing sheet 8 along a respective narrow string or strand 27 and 28, these parts of the tubular body will also be distanced from one another in a corresponding fashion. This means that the tubular body will be unfolded or raised from its flat state shown in Figure 2. In the illustrated embodiment, the tubular body is so dimensioned that when the diaper has the configuration shown in Figures 1 and 3, the tubular body will have been raised so as to be practically almost flattened in the longitudinal symmetry plane of the diaper in a plane at right angles to said symmetry plane and to the absorbent body, as will best be seen from Figure 3. The left part of Figure 5 is a cross-sectional view of the diaper in the absence of load thereon. As will be seen from this Figure, raising of the tubular body 26 from its flattened state shown on the right of Figure 5 and in Figure 2 decreases successively in a direction towards the side edges of the diaper, i.e. to the left in the left-hand part of Figure 5. The tubular body of this embodiment will thus have folds to an increasing extent towards the edges of the diaper. According to one variant, the tubular body can be given a circumference which decreases successively towards the side edges of the diaper from a central part delimited by the elastic threads 24, 25.

It is pointed out in this connection that Figure 1 shows the diaper in the absence of load and not in its state when worn. The shape of the diaper when worn will naturally depend on the anatomy of the wearer and the diaper is so dimensioned as to cause the elastic threads 24, 25 to be slightly stretched when putting on the diaper. However, the length of the diaper is such that a large part of the folds or gathers will remain in the top sheet after putting on the diaper, so that the absorbent body will be spaced from

the top sheet along a greater part of its extension, even when the diaper is in place on the wearer.

Thus, when the diaper is worn, there is located between the absorbent body and the top sheet a space in which urine and faeces can be held without coming into contact with the wearer's skin. It will be understood that the size and the positioning of the rear opening 15 is significant in ensuring that faeces discharged by the wearer will land in this space and not on the top sheet, particularly in respect of the faecal discharge point. It has been found that the distance between the side edges 18, 19 of the opening 15 should be at least 3 cm at the faecal discharge point, and that the front edge of the opening 15 should lie at least 1 cm, and preferably 2 cm, in front of the faecal discharge point, and that the front edge should have a length of at least 2 cm. Because the elastic threads 24, 25 exert a spring force in both the longitudinal and the transverse direction of the diaper, both the front edge and the side edges 18, 19 of the opening 15 are held stretched when the diaper is worn, so as to ensure that the aforesaid distance will be retained. In order to achieve a high stretching effect, the ends of the threads 24, 25 will preferably lie laterally on the level of the side edges of the absorbent body 1. The forward opening 16 in the top sheet 9 ensures that urine discharged by the wearer will fall directly onto the absorbent body and can therewith be absorbed immediately by said body.

The tubular body 26 forms a barrier which delimits the spaces beneath the openings 15, 16 from one another. This prevents urine and faeces mixing together, which would otherwise result in faecal enzymes splitting or cleaving urea in the urine, thereby forming ammonia. The formation of ammonia would result in an increase in pH, which in turn would result in increased activity of the enzymes protease and lipase in the faeces, giving rise to greater irritation

of the skin should faeces come into contact therewith. The arrangement also ensures that faeces are unable to land in the space beneath the forward opening 16 and therewith come into contact with the genitals of the wearer.

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In addition to gathering the top sheet 9, the elastic threads 20, 21 also lie against the wearer's body and therewith provide a sealing action. This greatly reduces the risk of urine discharged by male wearers landing on the top sheet and running along said sheet instead of passing down through the forward opening 16. Because the threads extend along the side edges of the openings 15, 16, the risk of the position of the openings 15, 16 changing due to external loads on the diaper, for instance caused by movement of the wearer, is also reduced at the same time. Another advantage is that if the absorbent body is pressed against the wearer's body by an externally acting load, it is more difficult for urine and faeces to leak over the edges of the openings 15, 16 and onto the top sheet 9 and there mixing together. It has been found that in order to achieve these sealing functions, the distance between the side edges 18, 19 of the rear opening 15 at the centre of the faecal discharge point should not be greater than 6 cm and preferably less than 5 cm. The length of the front edge of the opening 15 should not exceed 4 cm.

From an absorption aspect, the side bodies 3, 4 are not joined to the remainder of the absorbent body 1 and form safety bodies which absorb liquid when the main absorbent body 2 becomes saturated or is unable to absorb the fluid discharged for some other reason. In addition to this function, the side bodies contribute towards the stability of the basin formed by contraction or gathering of the top sheet, and also prevent the whole of the main body from lying against the wearer's body when the diaper is subjected to an external load.

The tubular body 26 may be comprised of liquid-impermeable or liquid-permeable material, and the same material may be used as that from which the bottom sheet, the inner casing sheet or the top sheet are made.

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Instead of a tubular body 26, which provides a two-wall barrier as shown in Figure 3, it is possible to construct the barrier between the openings 15, 16 from one single wall of flexible material which is mounted between the inner casing sheet and the top sheet in a folded or pleated state, for instance in a bellows-like state, and fastened to said sheets in the same manner as the tubular body 26.

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One such single-wall or sheet-like barrier 29 is shown in Figure 6, which is a longitudinal sectional view corresponding to the view of Figure 3 of a diaper comprising an absorbent body 30 enclosed between an outer and an inner casing sheet 31 and 32, and a top sheet 33 having a forward and a rearward opening 34 and 35 which are separated longitudinally by a top sheet region 36. The barrier 29 is comprised of a rectangular piece of liquid-impermeable or liquid-permeable material, which is disposed between the top sheet and the inner casing sheet in a single-fold in the same manner as that described earlier with reference to the tubular body 26. In this Figure, the raising or unfolding of the material piece 29 as a result of the top sheet being gathered in the vicinity of the side edges of the absorbent body and centrally between the side edges of the absorbent body is indicated in dotted and full lines respectively, while raising or unfolding of the material piece at a location between these positions is shown in broken lines.

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It is also possible to form the barrier from folds in the inner casing sheet or in the top sheet as illustrated schematically in Figures 7-10, which illustrate centre sections of the longitudinal sectional views corresponding

to Figure 6 of diapers constructed in the same manner as the diaper illustrated in Figure 6.

5 The inner casing sheet shown in Figure 7 includes two sheets 37, 38, of which the upper sheet is folded and fastened to the bottom sheet 38 at least along two trans-
10 versal joins 39, 40, which may consist of continuous or intermittent glue or weld joins and which are mutually spaced longitudinally. As will be seen from the Figure, which illustrates the configuration obtained when the top sheet is gathered or drawn together, the sheet 37 forms a U-shaped body between the joins, having two side walls 41, 42 and an upper wall 43 which are secured to the region 40 of the top sheet located between the openings therein,
15 preferably by gluing.

The barrier 44 illustrated in Figure 8 differs from the barrier 41-43 illustrated in Figure 7 by virtue of the fact that the opposing parts of the fold formed in the inner
20 casing sheet 45 have been mutually joined along the connections of the fold with the remainder of the casing sheet 45, so as to form a tubular body of triangular cross-section when the top sheet is gathered or drawn together in that part of the fold which lies transversely central in
25 and which is shown in this Figure.

Figures 9 and 10 illustrate a variant 47 of the fold 44 shown in Figure 8, this variant differing from the fold 44 by virtue of the fact that the fold walls 48, 49 are glued
30 together. Figure 9 illustrates the configuration of the fold 47 in the manufacturing stage of the diaper, while Figure 10 illustrates the fold 47 subsequent to gathering of the diaper top sheet. The fold is glued or welded to that region 50 of the top sheet which lies between the top
35 sheet openings.

Naturally, a barrier forming fold can be provided in the top sheet instead of in the inner casing sheet, similar to the manner shown in Figures 8-10.

5 It will be understood that the described embodiment of the invention can be modified within the scope of the invention. For instance, the shapes and dimensions of the openings in the top sheet can be varied, particularly with regard to the position of the mutually distal edges of the
10 openings. The invention can, of course, be applied with diapers whose absorbent body has a different construction and shape to that described, for instance rectangular absorbent bodies comprising one or more absorbent layers. The invention can also be applied, of course, with so-
15 called pant diapers, or training pants, and with incontinence guards. The invention is therefore limited solely by the content of the following Claims.

CLAIMS

1. An absorbent article having a front part (12), a rear part (14) and an intermediate crotch part (13), such as a
5 diaper, an incontinence guard or like article, which includes an absorbent body (1), a liquid-impermeable bottom sheet (7) joined to the absorbent body, and a top sheet (9) which is free from connection with the absorbent body over
10 a large part of its surface and which lies proximal to the wearer's body when the article is worn, and which top sheet includes an opening (15) which extends from the rear article part into the crotch part, and elastic devices (24, 25) which are fastened to the top sheet in a stretched state and which when contracting from said stretched state
15 cause the part of the top sheet that is not joined to the absorbent body to be distanced from said body, characterized in that the top sheet (9) includes a further opening (16) which extends from the front part (12) into the crotch part (13); and in that a piece (26) of flexible material
20 extends transversely across the article between the absorbent body (1) and the top sheet (9) within that region (17) of the top sheet that lies between the two openings (15, 16), said piece of flexible material being fastened to the absorbent body and to the top sheet.

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2. An article according to Claim 1, characterized in that the absorbent body (1) includes a liquid-permeable casing sheet (8) on that side thereof distanced from the bottom sheet (7).

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3. An article according to Claim 1 or 2, characterized in that the top sheet region (17) lying between the two openings (15, 16) is located between the wetting point and the faecal discharge point.

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4. An article according to any one of Claims 1-3, characterized in that the two openings (15, 16) in the top sheet

(9) have side edges (18, 19 and 20, 21) which diverge from the top sheet region (17) lying between said openings.

5 5. An article according to Claim 4, **characterized** in that the elastic devices (24, 25) in the top sheet (9) extend along the side edges (18-21) of the openings (15, 16).

10 6. An article according to any one of Claims 1-5, **characterized** in that the piece of material located between the top sheet openings (15, 16) and attached transversely between the top sheet (9; 40; 46) and the inner casing sheet (8; 37, 38; 45) of the absorbent body (1) has the form of a tubular body (26; 41-43; 44) which is joined to the inner casing sheet and the top sheet along a narrow region
15 extending transversely of the article.

20 7. An article according to any one of Claims 1-5, **characterized** in that the piece of material (29; 47) attached between the top sheet openings (34, 35) and transversely between the top sheet (33) and the inner casing sheet (32) of the absorbent body (30) has a sheet-like form.

25 8. An article according to Claim 6 or 7, **characterized** in that the piece of material attached between the top sheet openings and transversely between the top sheet and the inner casing sheet of the absorbent body forms an integral part of the top sheet.

30 9. An article according to Claim 6 or 7, **characterized** in that the piece of material (41-43; 44; 47) attached between the top sheet openings and transversely between the top sheet (40; 46; 50) and the inner casing sheet (37, 38; 45) of the absorbent body is an integral part of the inner casing sheet.

10. An absorbent article as claimed in claim 1 substantially as hereinbefore described with reference to Figures 1 to 5, or any one of Figures 6, 7, 8, 9 or 10.

Relevant Technical Fields

- (i) UK Cl (Ed.N) A5R (RPC, RPG, RPL) A3V
 (ii) Int Cl (Ed.6) A61F 13/15

Search Examiner
 MR N A FRANKLIN

Date of completion of Search
 9 JUNE 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
 1-10

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
 Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
 A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2268073 A (UNI-CHARM) note openings 8, 9 in Figures	
A	GB 1298527 (GUY-CLAUDE BURGER) note openings 4, 4a in Figures	

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